Description

Method for controlling a connection in a packet-oriented
communication network and arrangements for implementing said method

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In contemporary communication systems communication connections, in
particular real time connections, e.g. for voice, video or
multimedia communication, are also increasingly routed via packet-
oriented communication networks, e.g. local area networks or wide
10   area networks. Internet telephony, also frequently referred to as
VoIP telephony (Voice/Video over Internet Protocol) is for example
based on this technology.

Modern packet-oriented real time communication systems are
15   frequently based on a system architecture according to the ITU-T
recommendation H.323. A so-called gatekeeper is generally provided
for signaling control in such communication networks. While
connection signaling is routed between connection end points via
the gatekeeper, the user data to be transferred in the context of
20   the connection is transmitted directly via user data channels set
up between the connection end points. Communication systems
according to the H.323 recommendation provide a wide range of
service features known from conventional line-switched
communication technology, such as call forwarding, call diversion
25   and call waiting. A so-called pause and rerouting procedure is
frequently implemented in H.323 communication networks to support
or provide such service features. With the pause and rerouting
procedure the gatekeeper prompts a respective connection end point
to stop sending user data temporarily and to close the relevant
30   user data channels. Once the user data channels are successfully
closed, the gatekeeper can prompt the opening of new

user data channels with modified characteristics or between other
connection end points. Simple connection control can thus be
implemented. The pause and rerouting procedure is for example
described in section 8.4.6 of the H.323 recommendation.

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In order to determine before new user data channels are opened
whether the data channels to be closed have been closed
successfully, according to the prior art to date all the user data
channels of all existing connections have to be managed centrally
10   by the gatekeeper. This also relates in particular to connections
in which a pause and rerouting procedure is not executed. Such
channel management however on the one hand requires a significant
implementation outlay, both with regard to processing power and
storage capacity, and on the other hand results in a greater
15   susceptibility to error due to the database organization
additionally required with its associated synchronization
requirements. Both aspects have a negative impact on the
scalability of a communication system.

20   The object of the present invention is to specify a method for
controlling a connection in a packet-oriented communication
network, with simpler sequence control than the prior art. The
object of the invention is also to specify a signal control device
and a packet-oriented communication network for implementing the
25   method.

This object is achieved by a method with the features of Claim 1, a
signaling control device with the features of Claim 16 and a
packet-oriented communication network with the features of Claim
30   17.

To control a connection, in particular a real time or quasi-real
time connection, in a packet-oriented communication network, a

signaling control device of the communication network prompts a
first of a plurality of communication end points connected via at
least one user data channel, in particular a logical user data
channel, to close the at least one user data channel by
5   transmitting a first signaling message.

The signaling control device can preferably be provided by a so-
called gatekeeper according to the ITU-T recommendation H.323 or
alternatively by a so-called SIP server according to the IETF
10   standard SIP (Session Initiation Protocol). A respective
communication end point may for example be a communication
terminal, a so-called gateway between the packet-oriented
communication network and a line-oriented communication network, a
personal computer, a communication application or a communication
15   client. The signaling control device is also used to transmit a
confirmation request message to a second of the communication end
points, prompting this latter to transmit a confirmation message to
the signaling control device when the at least one user data
channel has been successfully closed. If the confirmation message
20   is received by the signaling control device, the latter prompts a
communication end point, which can either be one of the
communication end points referred to above or a further
communication end point, to open at least one new user data channel
by transmitting a second signaling message.
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The inventive method makes it possible to ensure in a simple manner
that the at least one user data channel to be closed has closed
successfully, before a new user data channel is opened. Use is made
here of the fact that a communication end point in a packet-
30   oriented communication network manages its outgoing user data
channels in an essentially independent manner and is thereby able
to identify the successful closure of a user data channel directly.
The inventive requesting of a channel closure

confirmation from a communication end point can therefore be
implemented with little outlay. In particular only a slight
increase in signaling outlay is required and only then if a user
data channel actually has to be closed and a new user data channel
5   has to be opened. It is therefore not necessary for the signaling
control device to manage and store user channel usage for all
existing connections. This results in a significant economy with
regard to storage capacity and processing outlay compared with the
prior art and therefore a reduced susceptibility to error and
10 better scalability.

Advantageous embodiments and developments are set out in the
dependent Claims.

15 According to a first embodiment of the invention transmission of
the confirmation request message to the second communication end
point can take place in the context of the user data channel
closure prompted by the first signaling message, as a result of
which the second communication end point is prompted to confirm
20 this user data channel closure when successful. In this case the
confirmation message confirms only a single closing process, in
which at least one user data channel is closed.

According to a second embodiment transmission of the confirmation
25 request message to the second communication end point can take
place after the connection has been set up, as a result of which
the second communication end point is prompted for the duration of
the connection to transmit a confirmation message to the signaling
control device when a user data channel has been successfully
30 closed. In this case a respective confirmation request message only
has to be sent once per connection, thereby reducing the required
signaling outlay compared with the first embodiment.

According to a third embodiment of the invention transmission of
the confirmation request message to the second communication end
point can take place after registration of the second communication
end point with the signaling control device, as a result of which

5   the second communication end point is prompted for the duration of
its registration to transmit a confirmation message to the
signaling control device when a user data channel has been
successfully closed. In this case only one confirmation request
message has to be transmitted per registration, thereby reducing

10   the signaling outlay compared with the first embodiment.

According to a further advantageous embodiment the first
communication end point can be identical to the second
communication end point. In particular this means that the

15   confirmation request message is transmitted to the communication
end point, which is prompted by the first signaling message to
close the at least one user data channel.

According to one advantageous development of the invention, if the

20   confirmation message is not received within a predefined time
interval, the signaling control device can analyze signaling
traffic transmitted in the context of the connection to identify
successful closure of the at least one user data channel. When
successful closure has been identified, the signaling control

25   device can prompt the opening of the at least one new user data
channel. The signaling control device thus behaves in a backward-
compatible manner, in so far as communication end points according
to the prior art can also be activated, which are not designed for
the inventive method.

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A generic message extended to include a specific confirmation
request information element can also be transmitted as the
confirmation request message and/or a generic message extended to
include a specific confirmation information element can be

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transmitted as the confirmation message. Such a generic message can hereby be extended in each instance to include a specific data field or an existing generic field of a respective message can be assigned a corresponding significance, for example in the context

5   of a so-called GEF feature (Generic Extensibility Feature) according to the ITU-T H.460.x series recommendations.

A channel closure message, e.g. a so-called CLC message (Close Logical Channel) to close the at least one user data channel can be

10   transmitted from the first communication end point to a communication end point connected to this via the at least one user data channel via the signaling control device.

The communication network can preferably be set up according to the

15   ITU-T recommendation H.323. In this case a so-called terminal capability set message according to the ITU-T recommendation H.245 with an empty capability set can also be transmitted as the first signaling message. Receipt of such a terminal capability set message with an empty capability set prompts a communication end

20   point to close its user data transmission channels.

The confirmation request message and/or the confirmation message respectively can also be configured as a so-called RAS (Registration, Admission and Status) message according to the ITU-T

25   recommendation H.225.0. IRQ (Information Request) messages, IRR (Information Request Response) messages, ACF (Admission Confirm) messages and/or RCF (Registration Confirm) messages can for example also be used as RAS messages. When an ACF or RCF message is used as a confirmation request message, a confirmation request can relate

30   to the duration of a connection or the duration of a registration.

According to a further embodiment of the invention the
communication network can be set up according to the IETF standard
SIP (Session Initiation Protocol).

5   According to an advantageous development of the invention it can be
specified by the confirmation request message whether the
successful closure of a user data transmission channel and/or
whether the successful closure of a user data receiving channel
should be confirmed. Similarly it can be specified by the
10   confirmation message whether a successfully closed user data
channel is a user data transmission channel or a user data
receiving channel.

An exemplary embodiment of the invention is described in more
15   detail below with reference to the drawing, in which:

Figure 1 shows a diagrammatic representation of a packet-oriented
communication system with terminals linked via logical user data
channels in different network zones and

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Figures 2 and 3 show diagrammatic representations of a flow diagram
of an inventive signaling sequence during the opening and closing
of a user data channel.

25   Figure 1 shows a diagrammatic representation of a packet-oriented
communication system comprising different network zones NZA and
NZB. The network zones NZA and NZB can be both different packet-
oriented communication networks and different subnetworks of the
same or different communication networks. In the present exemplary
30   embodiment it should be assumed that the network zones NZA and NZB
are configured as internet protocol-based communication networks
according to the ITU-T recommendation H.323. While the network zone
NZA comprises a terminal EPA as the communication or connection end

point and a signaling control device GKA, the network zone NZB has
a terminal EPB as its communication or connection end point and a
signaling control device GKB.

5   In the context of a real time connection logical user data channels
RTP1 and RTP2 are open between the terminals EPA and EPB for the
real time transmission of user data, e.g. in the form of voice,
video or multimedia data streams, according to the so-called RTP
protocol (Real Time Protocol). The user data channels RTP1, RTP2
10 operate directly between the terminals EPA and EPB. The user data
channel RTP1 is thereby used for the transmission of user data from
the terminal EPA to the terminal EPB and the user data channel RTP2
for the transmission of user data from the terminal EPB to the
terminal EPA. From the point of view of the terminal EPA the user
15 data channel RTP1 is therefore a user data transmission channel and
the user data channel RTP2 is a user data receiving channel.

The signaling control devices GKA and GKB, which can for example be
in the form of gatekeepers according to the H.323 recommendation,
20 are each responsible for controlling call signaling at signaling
level in their respective network zones NZA and NZB. To this end
channel control signaling KS takes place respectively between the
signaling control device GKA and the terminal EPA, between the
signaling control device GKB and the terminal EPB and mutually
25 between the signaling control devices GKA and GKB. In particular
user signaling between the terminals EPA and EPB in the context of
the channel control signaling KS is routed via the signaling
control devices GKA and GKB. The user data channels RTP1 and RTP2
are controlled according to the ITU-T recommendation H.245 by the
30 channel control signaling KS.

The signaling control devices GKA and GKB are themselves not
directly involved in the transmission of user data, as this is
transmitted directly between the terminals EPA and EPB. This type
35 of data transmission is also frequently referred to as peer-to-peer

transmission. There is therefore no need for complex user data
channel management in the signaling control devices GKA and GKB.

Network zone-internal so-called RAS (Registration, Admission and
5   Status) signaling according to the ITU-T recommendation H.225.0
also takes place between the signaling control device GKA and the
terminal EPA and between the signaling control device GKB and the
terminal EPB. In the context of the RAS signaling RAS, shown in
Figure 1 with a broken line, RAS messages are exchanged between the
10   terminal EPA or EPB and the signaling control device GKA or GKB
responsible for its network zone NZA or NZB. Provision is however
not made for RAS messages to be transmitted between the signaling
control devices GKA, GKB of different network zones NZA and NZB.

15   Figures 2 and 3 each show a flow diagram to illustrate an inventive
signaling sequence during the opening and closing of a user data
channel. Both Figures 2 and 3 relate to an initial situation, in
which an active connection exists with open user data channels RTP1
and RTP2 between the terminals EPA and EPB. Media streams can be
20   rerouted, e.g. in the context of a conference circuit, in a simple
fashion by closing and then opening user data channels.

Figure 2 shows a first embodiment of the inventive method, in which
the signaling control device GKA prompts the terminal EPA in its
25   network zone NZA to close its user data transmission channel RTP1.
To this end the signaling control device GKA sends a so-called
terminal capability set message TCS0 according to the ITU-T
recommendation H.245 with an empty capability set to the terminal
EPA as the first signaling message in the context of the channel
30   control signaling KS. The terminal capability set message TCS0 with
its empty capability set prompts the terminal EPA indirectly to
close all its user data transmission channels, in this case only
RTP1, in the context of the existing connection. The signaling
control device GKA then transmits a so-called IRQ (Information
35   Request) message in the context of the RAS signaling RAS. According

to the ITU-T recommendation H.225.0 an IRQ message is generally used to request information.

According to the invention the IRQ message contains a new
5   information element reportTccd (report transmit channels closed), by means of which the terminal EPA is prompted to confirm successful closure of the user data channel RTP1. The IRQ message IRQ is therefore used as a confirmation request message.

10   To close the user data channel RTP1, the terminal EPA sends a channel closure message CLC (Close Logical Channel) according to the ITU-T recommendation H.245 transparently via the signaling control devices GKA and GKB to the terminal EPB in the context of the channel control signaling KS. The terminal EPB then confirms
15   successful closure of the user data channel RTP1 by means of a channel closure confirmation message CLCAck, which is transmitted transparently via the signaling control devices GKB and GKA to the terminal EPA. If a plurality of user data channels have to be closed, the channel-specific messages CLC and CLCAck should be
20   transmitted respectively for each of the user data channels to be closed.

Receipt of the channel closure confirmation message CLCAck allows the terminal EPA - unlike the signaling control devices GKA and GKB
25   - to identify successful closure of the user data channel RTP1 directly. As a result the terminal EPA - prompted by the IRQ message IRQ - sends a so-called IRR (Information Request Response) message as a confirmation message to the signaling control device GKA in the context of the RAS signaling RAS. Such an IRR message is
30   generally used according to the ITU-T recommendation H.225.0 to

respond to a previously received IRQ message. For implementation of
the inventive method, the IRR message IRR contains a new
information element tccd (transmit channels closed) by means of
which the successful closure of the user data channel RTP1 is
5   confirmed.

On receipt of the IRR message IRR with the information element tccd
the signaling control device GKA identifies that the user data
channel RTP1 has been successfully closed. As a result the
10   signaling control device GKA transmits a terminal capability set
message TCSB according to the ITU-T recommendation H.245 with a
non-empty capability set to the terminal EPA as a second signaling
message in the context of the channel control signaling KS. The
terminal capability set message TCSB with its non-empty capability
15   set prompts the terminal EPA to open one or a plurality of new user
data transmission channels. The closing and opening of user data
transmission channels by means of terminal capability set messages
is also referred to as a pause and rerouting procedure.

20   To open a new user data transmission channel the terminal EPA
transmits a channel opening message OLC (Open Logical Channel) via
the signaling control devices GKA and GKB to the terminal EPB or to
another terminal in the context of the channel control signaling
KS. Opening of the new user data channel is confirmed by a channel
25   opening confirmation message OLCAck.

Figure 3 shows a second embodiment of the inventive method, in
which the signaling control device GKA prompts the terminal EPB in
the other network zone NZB to close its user data transmission
30   channel RTP2. To this end the signaling control device GKA sends a
terminal capability set message TCS0 with an empty capability set
via the signaling control device GKB to the terminal EPB as a first
signaling message in the context of the channel control signaling
KS. The terminal EPB is thereby indirectly prompted to close all
35   its user data transmission channels, in this case only RTP2, in the
context of the existing connection. Unlike with the first

embodiment of the invention described above, the signaling control
device GKA cannot transmit a RAS message as a confirmation request
message to the terminal EPB prompted to close its user data
transmission channels, as there is generally no provision for the
5   transmission of RAS messages between different network zones.

To resolve this problem, the signaling control device GKA sends an
IRQ message IRQ as a confirmation request message to the terminal
EPA in the context of the RAS signaling RAS. This IRQ message IRQ
10   thereby contains a new information element reportRccd (report
receive channels closed), by means of which the terminal EPA is
prompted to confirm the successful closure of its user data
receiving channel RTP2.

15   On receipt of the terminal capability set message TCS0 with its
empty capability set the terminal EPB sends a channel closure
message CLC to the terminal EPA in the context of the channel
control signaling KS. The terminal EPA then closes its user data
receiving channel RTP2 and confirms its successful closure by
20   transmitting a channel closure confirmation message CLCAck to the
terminal EPB. The terminal EPA – prompted by the prior receipt of
the IRQ message IRQ with the information element reportRccd – also
confirms the successful closure of its user data receiving channel
RTP2 by transmitting an IRR message IRR. According to the invention
25   the IRR message IRR thereby contains a new information element rccd
(receive channels closed). The information element rccd confirms
the successful closure of the user data channel RTP2 to the
signaling control device GKA.

After this confirmation the signaling control device GKA can prompt
the opening of one or a plurality of new user data transmission
channels by transmitting a terminal capability set message TCSA
with a non-empty capability set to the terminal EPB or to another
5   terminal. To open a new user data transmission channel the terminal
EPB, as already described similarly in relation to Figure 2,
transmits a channel opening message OLC in the context of the
channel control signaling KS to the terminal EPA, which confirms
this by means of a channel opening confirmation message OLCAck.
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The signaling sequences illustrated in Figures 2 and 3 can
advantageously be combined to close and open user data channels
RTP1, RTP2 in a parallel fashion at both terminals EPA and EPB. To
this end the signaling control device GKA can transmit a terminal
15   capability set message TCS0 with an empty capability set in a
parallel fashion to both terminals EPA and EPB. Correspondingly the
signaling control device GKA can transmit an IRQ message to the
terminal EPA, containing both the information element reportTccd
and the information element reportRccd. The terminal EPA is thereby
20   prompted to confirm the successful closure of both its user data
transmission channel RTP1 and its user data receiving channel RTP2.
Confirmation can be effected in some instances by means of an IRR
message containing the information elements Tccd and Rccd.

25   Alternatively a signaling control device, in this case GKA, can
activate a communication end point, in this case EPB, which is
located in an external network zone, in this case NZB, by means of
messages and information elements according to the ITU-T
recommendations H.225.0 annex G or H.501 or via corresponding
30   protocols.

The inventive method allows a specific exchange of information
between the communication end point and the signaling control

device about the successful closure of user data channels. The
method is based on existing functionalities and develops these
specifically. Because it uses existing or standard messages, the
method can in particular be deployed in a backward-compatible
5   fashion, so that essentially no interoperability problems occur.
The increased signaling outlay resulting from the additional IRQ
and IRR messages can be considered as negligible, particularly as
this increased outlay only occurs when user data channels are
closed and opened again as described.

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The inventive method, which is described in the exemplary
embodiment in relation to an H.323 communication system, can also
be used similarly in other packet-oriented communication systems,
for example in so-called SIP (Session Initiation Protocol)
15 communication systems in the context of the so-called re-invite
method.